

Physics PhDs Ten Years Later: Duties and Rewards in Government Positions

Results from the PhD Plus 10 Study

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The PhD Plus 10 Study was our first follow-up survey of mid-career physics PhD recipients. In 2011, we contacted individuals who graduated with a physics PhD from the classes of 1996, 1997, 2000, and 2001 in the United States. Of those who responded to our survey, 225 were employed in the US government sector. This includes individuals employed at national labs, federal agencies, state or local governments, and in the military on active duty. In this report, we will describe the activities that government employees perform during their work, and what they find rewarding about their positions.

Who they are

Of government respondents, 67% reported that they worked in physics or astronomy, and 30% reported that they worked in other STEM fields (**Table 1**). Respondents reported working in a wide range of physics and STEM fields, demonstrating the diverse possibilities of a physics PhD. **Table 2** shows the common job titles for respondents in government, which includes research, engineering, technical, and management positions.

Table 1

Fields of Mid-career Physicists Working in Government Positions

Physics or Astronomy Fields	Other STEM Fields
Astronomy and astrophysics Biological physics Condensed matter Geophysics Materials science Medical and health physics Nonlinear dynamics and chaos Nuclear physics Optics and photonics Particles and fields Plasma and fusion Space physics and cosmic rays	Biology or life sciences Computer science Earth, atmospheric, or ocean sciences Engineering

Table 2

Common Job Titles of Mid-career PhD Physicists Working in Government Positions	
	Engineer Manager Physicist Project Leader Research Scientist Technical Staff
AIP Statistics	aip.org/statistics

What they do

We asked government respondents to “briefly describe your duties and responsibilities in your current job.” Most respondents reported that they performed duties related to research, development, and project management. Below is a list of the most frequently reported duties and responsibilities:

1. Managing teams of scientists, engineers, or technicians
2. Developing new intellectual property including: systems, models, instruments, programs, algorithms, and software
3. Performing data analysis
4. Writing proposals, publications, or technical reports
5. Using instruments to measure scientific phenomenon
6. Mentoring postdocs and students

There were also unique duties and responsibilities performed by government respondents, as compared to those not reported by respondents employed in academia or industry.¹

1. Providing expert reviews on new technology designs
2. Inspecting facilities, performing safety reviews, and creating field standards
3. Auditing for agency operations, procedures, and financials

Other respondent duties included running experiments, creating simulations and models, budgeting projects, examining and licensing patents, coordinating training courses, and conducting systems maintenance.

¹ See “[Physicists in the Private Sector: Briefly describe your duties and responsibilities in your current job](#)” and “Physics PhDs Ten Years Later: Duties and Rewards in Academic Positions”

How often they use different skills

In our survey, we asked government respondents “how often do you use or do the following things in your current job?” Respondents rated how often they used 24 different skills (daily, weekly, monthly, less than monthly, or not at all). Overall, respondents used the following skills the most often: working on a team, using basic physics principles, performing complex problem solving, collaborating with physicists, and collaborating with individuals from diverse professions. The skills used the least often included: writing reports for non-technical audiences, working on proposals, working with customers, providing technical support, and performing teaching or training. **Figures 1–5** depict respondents’ skill usage across five categories: research skills, interpersonal skills, technical skills, managerial skills, and communication skills.

Figure 1

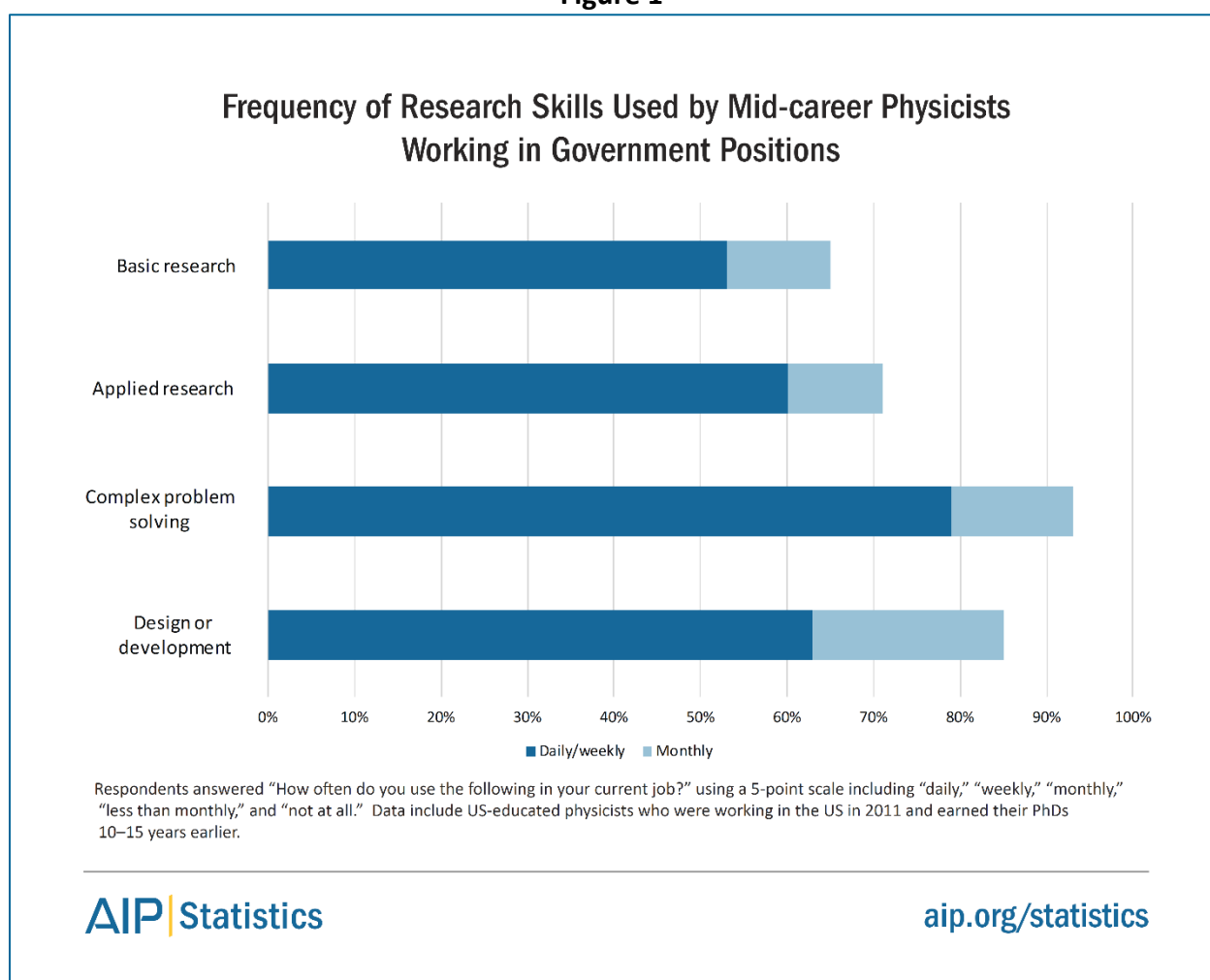


Figure 2

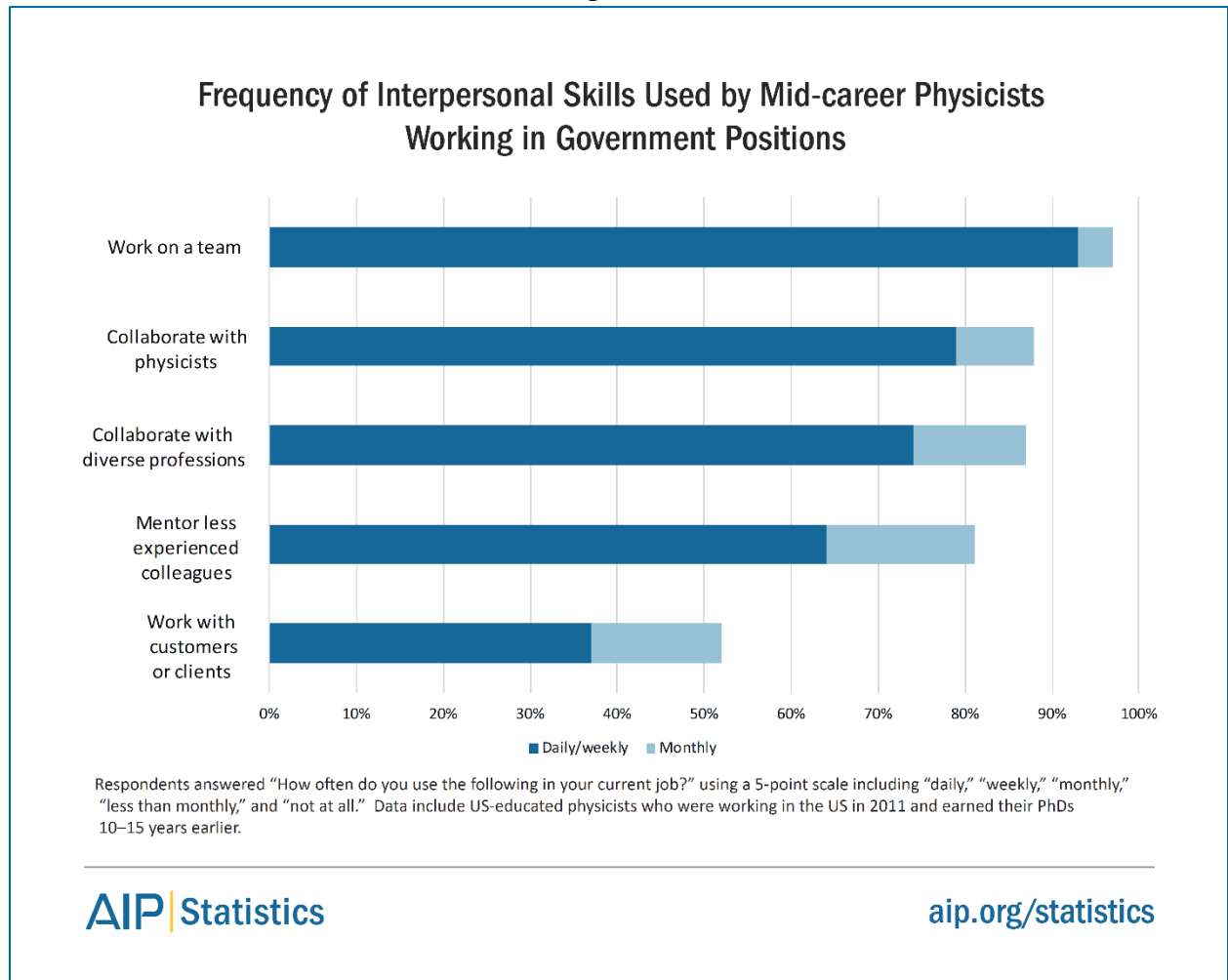


Figure 3

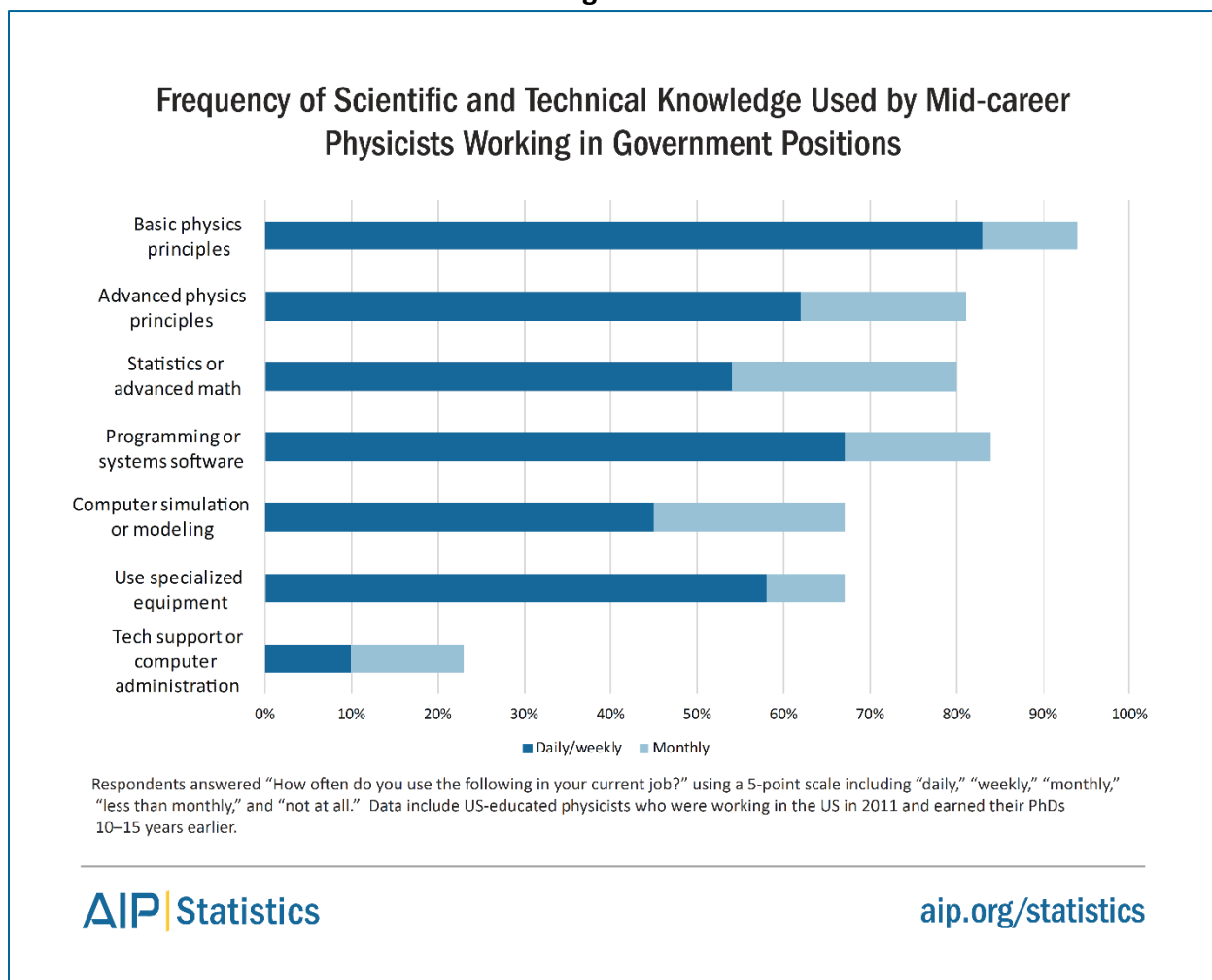
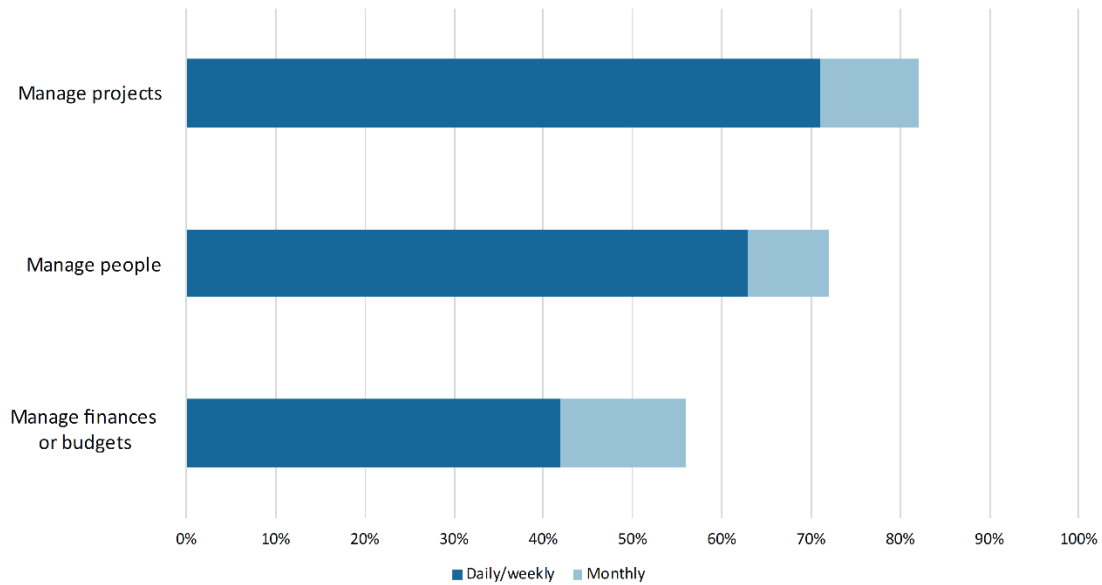


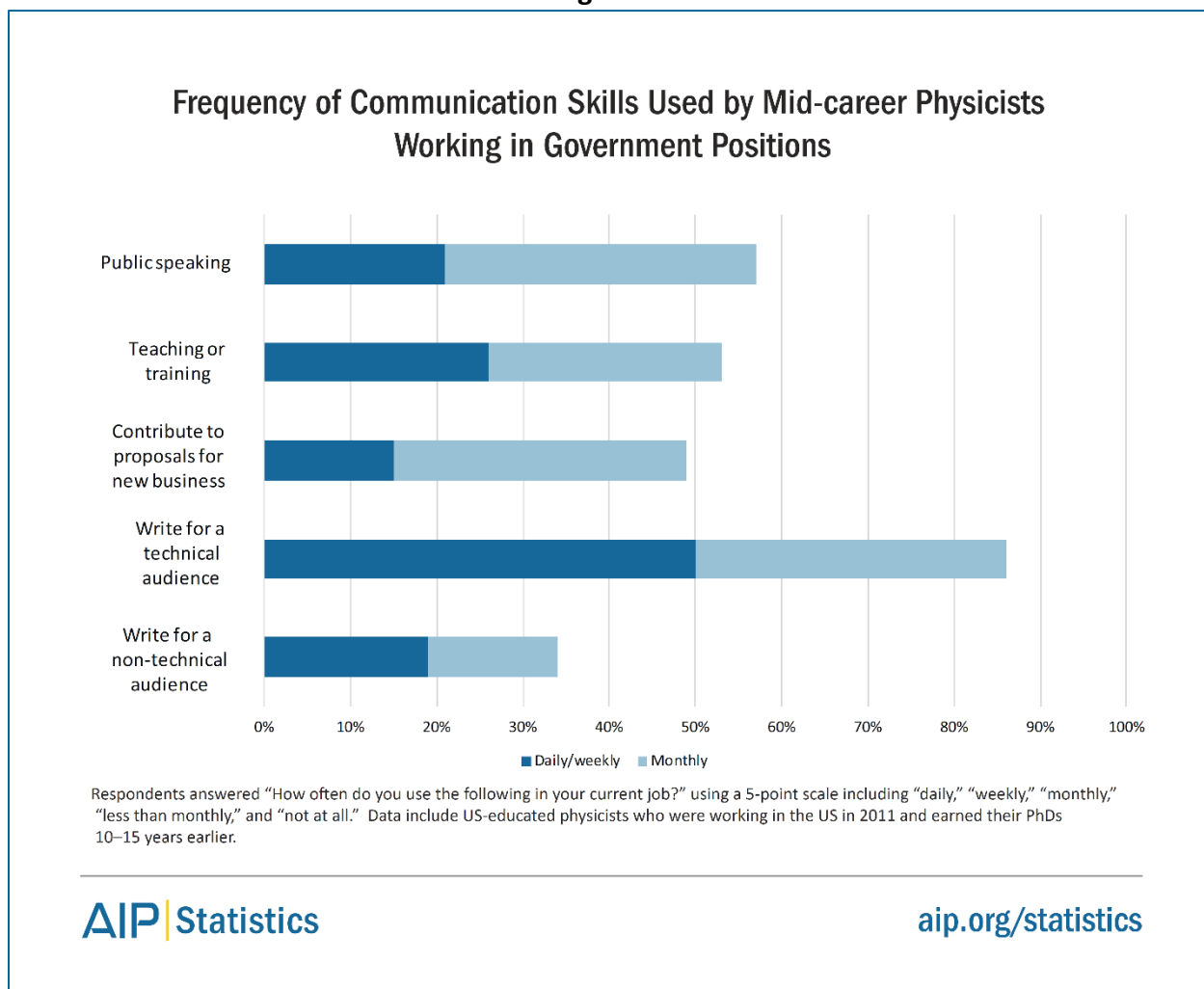
Figure 4

Frequency of Managerial Skills Used by Mid-career Physicists Working in Government Positions



Respondents answered "How often do you use the following in your current job?" using a 5-point scale including "daily," "weekly," "monthly," "less than monthly," and "not at all." Data include US-educated physicists who were working in the US in 2011 and earned their PhDs 10–15 years earlier.

Figure 5



What is rewarding about their work

We asked government respondents: "what are the most rewarding aspects of your current job?" In the responses, we found four major themes describing these rewarding aspects: intellectual rewards, institutional rewards, social rewards, and societal rewards.

Intellectual rewards. This theme describes mental skills and activities that respondents enjoyed in their current positions, particularly during research. Government respondents felt rewarded when they discovered new things, completed experiments or research projects, and found results.

"Observing something that's never been seen before is very exciting"

"Seeing research projects come to fruition"

"Experiencing important discoveries first-hand"

"Intellectual stimulation and constant need to keep learning"

“Figuring out how things work”

Many respondents also felt rewarded when they used their problem solving and critical thinking skills to address complex and challenging issues. Furthermore, respondents enjoyed solving diverse problems that required using a variety of skills.

“Solving scientific and technical problems that are intellectually difficult”

“Working on challenging problems that require understanding the interactions within very complex systems”

“Every day I solve new problems of diverse types (interpersonal, technical, scientific, etc.)”

“Variety of work tasks (programming, theory, fabrication, measurement)”

“Complex problem solving, design, construction and operation of space instruments”

“Physics is fun (ok, I'm a geek)”

Institutional rewards. This theme includes any rewards that were related to an institution or organization’s available benefits and resources for their current positions. Most importantly, respondents felt rewarded when they had the autonomy and flexibility to pursue their intellectual interests and schedule their own work hours. They valued the resources available in their positions and felt rewarded when their job provided good benefits, salaries, and stability.

“Job security while doing something I enjoy”

“Great, stable, culture. Lots of interesting problems to solve and resources to solve them”

“Freedom to research without need to constantly seek funding”

“Tremendous research freedom and resources/equipment”

“Flexibility in research area and in work hours”

Social rewards. This theme describes positive social interactions that respondents experience in their current positions. Government respondents felt rewarded when they collaborated with other team members and scientists who are interdisciplinary, diverse, and talented. Respondents also felt rewarded when mentoring younger students, postdocs, and researchers. Lastly, respondents enjoyed feeling connected and active in their research community.

“Working on a team and collaborating with a dynamic group of researchers”

“Working with a diverse group of people with different skill sets”

“Working with an interdisciplinary team of world-class researchers”

“Being an active part of the research community”

“Recognition by peers in the field of optics and materials science”

“Managing and guiding others in their technical careers”

“Helping young researchers become fully engaged in condensed matter physics”

Societal rewards. This theme includes any motivations to help society and the larger scientific community. Government respondents felt rewarded when the results of their work were applied outside of their lab and organization, and when they gave back to the general public and their scientific field. Specifically, respondents described how their work benefited the military, national security, public health, and the environment.

“Helping new inventions get to the commercial marketplace to benefit the public that funded the research”

“Making a contribution on a national level at a faster pace than in the lab”

“Seeing technologies that I've developed or helped develop being applied in the field”

“Making a difference in potentially saving the lives of warfighters”

“Ensuring public health, public safety, and protection of the environment from ionizing Radiation”

“Working on a problem, climate change, that is of utmost importance for humanity and the planet”

“Shaping the future direction of research conducted to improve the Nation's security”

“The feeling that my work has a contribution to the understanding of mood disorders”

“Developing technology that is important to U.S. energy independence... It's cool to have a front-row seat”

Overall. When examining all the rewarding job aspects reported by government respondents, some rewards were mentioned more often than others. Below is a list of the rewards that were the most frequently reported:

1. Collaborating with other team members or scientists
2. Using problem solving skills to address diverse, complex, and challenging issues
3. Mentoring students, postdocs, or younger scientists
4. Learning new things through research
5. Having a positive impact on society
6. Having autonomy and flexibility in their position

Summary

The results of this report demonstrate that mid-career physics PhD graduates employed in government are working in diverse physics and STEM fields and in a wide variety of positions. Within these government jobs, most employees performed duties related to research, development, and project management. Individuals working in government reported experiencing many intellectual, work environment, social, and societal rewards in their career. The most frequently reported rewards included: collaborating with team members, solving complex and difficult problems, mentoring others, learning new things, and having a positive impact on society.

Survey methodology

During 2011, we contacted over 3,400 physics PhD recipients from the classes of 1996, 1997, 2000, and 2001, and who graduated from US institutions. We received responses from 1,544 individuals that were currently working in the US. We know that the respondents are not representative. It was easier to find members of the more recent classes than the earlier classes, and based on an analysis of the respondents by contact wave, we believe that it was harder to contact individuals employed in industry than those in academia or the government.

For a complete overview of the methodology, please see the Appendix in *Common Careers of Physicists in the Private Sector* by Roman Czujko and Garrett Anderson. This report is available online [here](#) (or at <https://www.aip.org/statistics/reports/common-careers-physicists-private-sector>).

Related projects

The Statistical Research Center also conducts surveys with recent physics degree recipients one year after graduation. The reports from these survey studies include data on starting salaries, employment sectors, employment fields, and skills used by employed physics degree recipients. The reports can be found at the following link: <https://www.aip.org/statistics/employment>.

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